

Soil Protection in Bulgaria

Teodora Trichkova

Institute of Biodiversity and Ecosystem Research
Bulgarian Academy of Sciences

Contents

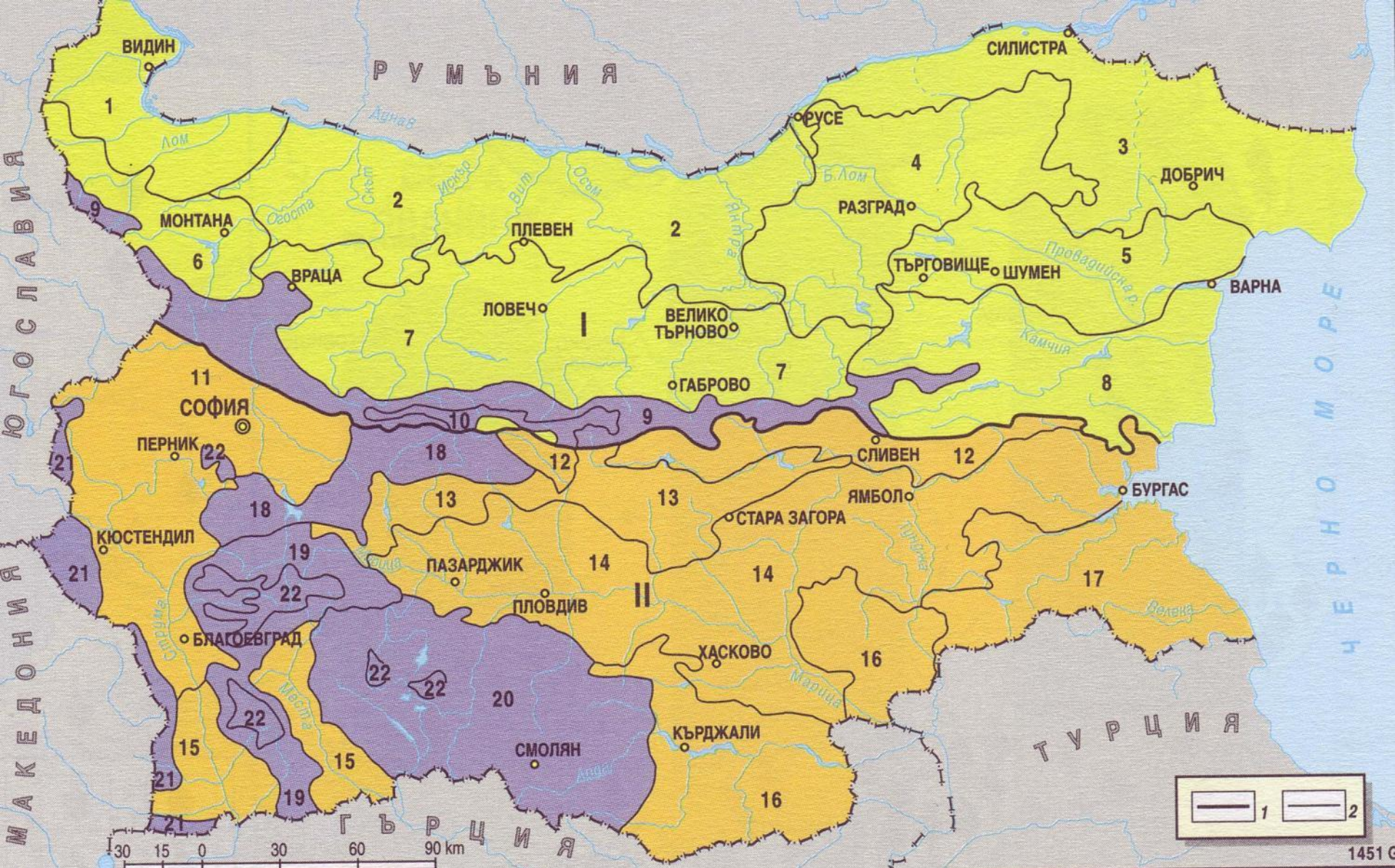
1. Soil geographic regions in Bulgaria
2. Soil types in Bulgaria and the Danube River basin
3. Soil degradation
4. Soil protection policy in Bulgaria



1. Soil geographic regions in Bulgaria

The soils on the territory of Bulgaria belong to two European soil geographic regions – Danube-Carpathian region and Mediterranean region which are parts of the Sub-boreal and Sub-tropical soil areas of Europe.

Soil Region	Soil Sub-region	Soil Province
Danube-Carpathian	Lower Danube	10 soil provinces
Mediterranean	Balkan-Mediterranean	12 soil provinces



I – LOWER DANUBE SOIL SUB-REGION

1/2 – boundary of soil sub-region/province

1 – West Lower Danube; 2 – Central Lower Danube; 3 – Danube–Dobrudzha; 4 – Ludogorie; 5 – Provadia; 6 – West Fore-Balkan; 7 – Central Fore-Balkan; 8 – East Fore-Balkan.

2. Soil types in Bulgaria

The present soil cover of Bulgaria is quite diverse. The broad range of soils and soil formations contrast to the small territory of the country and it is determined by its geological history, the large number of soil forming rocks, different genesis and morphometry of the relief, bio-climatic diversity and its geographical position.

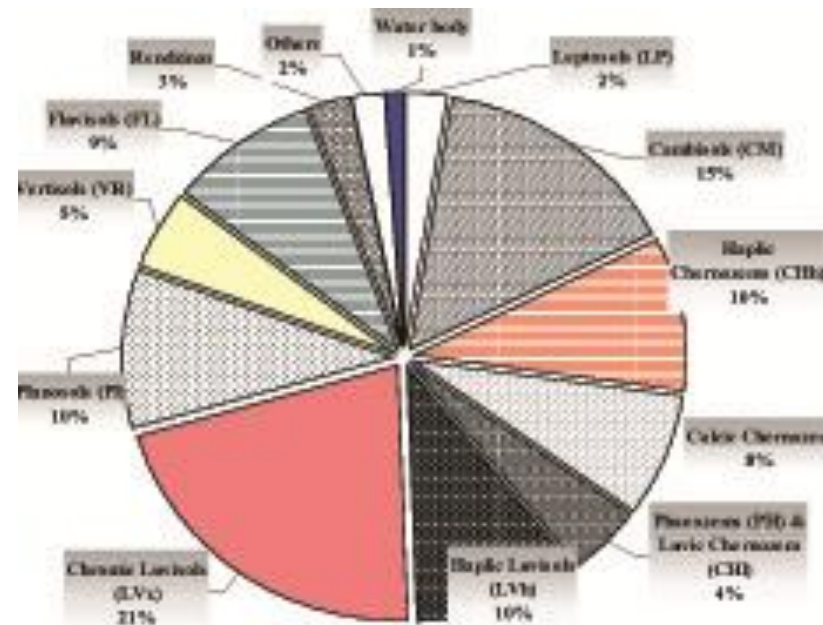
As a result, 55 soil units belonging to 20 major soil groups and 8 orders are found on the territory of Bulgaria (based on FAO classification; Geography of Bulgaria, 2002).

The most widely spread are:

Chromic Luvisols (21% in red), followed by Chernozems (20%), Cambisols 15%, Haplic Luvisols (10% black) and Fluvisols (9%).

Least spread soils are:

Solonetz and Solonchaks (0.22%)
(Koutev & Kolev, 2008).



Soil types in the Danube River basin

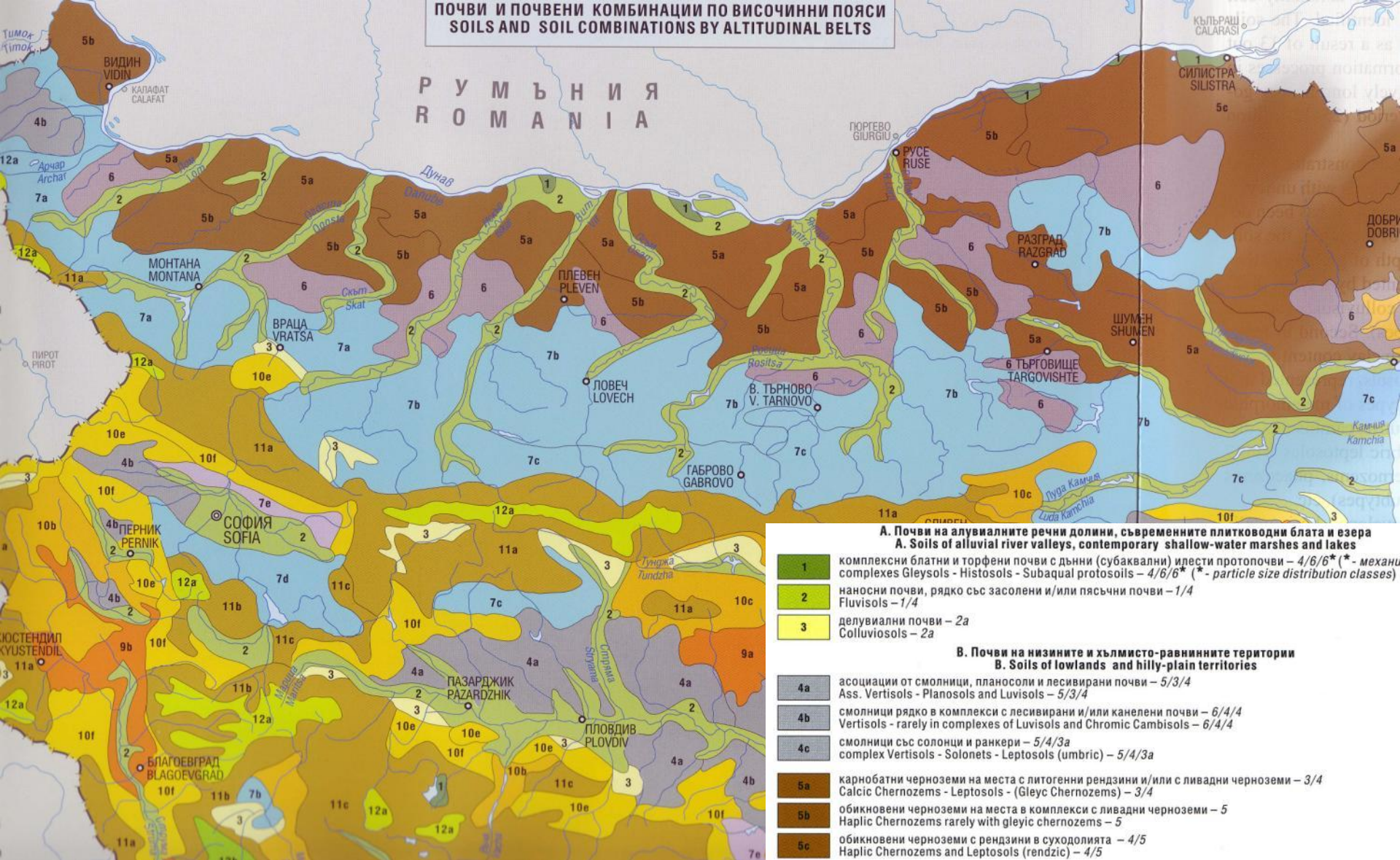
In the Danube River basin, the main soil-forming rocks are the loess, carbonate materials, conglomerates and sandstone, and in the lowlands and the river terraces – alluvial and delluvial mantle.

The most widely found are **Chernozems – calcic, haplic and luvic**.

Second by importance, are the **Fluvisols – calcaric, eutric, salic and gleyic** (alluvial and alluvial-meadow soils). **Gleysols** are found at some sites along the river.

Phaeozems, Luvisols (dark-grey forest soils) and **Vertisols** are found in the Northwestern part of Bulgaria.

ПОЧВИ И ПОЧВЕНИ КОМБИНАЦИИ ПО ВИСОЧИННИ ПОЯСИ
SOILS AND SOIL COMBINATIONS BY ALTITUDINAL BELTS



A. Почви на алувиалните речни долини, съвременните плитководни блата и езера
A. Soils of alluvial river valleys, contemporary shallow-water marshes and lakes

- 1** комплексни блатни и торфени почви с дънни (субаквални) илести протопочви – 4/6/6* (* - механични комплекси Gleysols - Histosols - Subaqual protosols – 4/6/6* (* - particle size distribution classes)
- 2** наносни почви, рядко със засолени и/или пясъчни почви – 1/4
Fluvisols – 1/4
- 3** делувиални почви – 2a
Colluviosols – 2a

B. Почви на низините и хълмисто-равнинните територии
B. Soils of lowlands and hilly-plain territories

- 4a** асоциации от смолници, планосоли и лесивирани почви – 5/3/4
Ass. Vertisols - Planosols and Luvisols – 5/3/4
- 4b** смолници рядко в комплекси с лесивирани и/или канелени почви – 6/4/4
Vertisols - rarely in complexes of Luvisols and Chromic Cambisols – 6/4/4
- 4c** смолници със солонци и ранкери – 5/4/3a
complex Vertisols - Solonets - Leptosols (umbric) – 5/4/3a
- 5a** карбонатни черноземи на места с литогени рендзини и/или с ливадни черноземи – 3/4
Calcic Chernozems - Leptosols - (Gleys Chernozems) – 3/4
- 5b** обикновени черноземи на места в комплекси с ливадни черноземи – 5
Haplic Chernozems rarely with gleyic chernozems – 5
- 5c** обикновени черноземи с рендзини в суходолията – 4/5
Haplic Chernozems and Leptosols (rendzic) – 4/5
- 6** лесивирани фαιοземи – 5
Luvic Phaeotems – 5

C. Почви на хълмистите и нископланинските територии
C. Soils of lowlands and low-mountain territories

- 7a** асоциации от лесивирани почви, рендзини и планосоли – 5/4a/4
Ass. Luvisols - Leptosols (zendzic) - Planosols – 5/4a/4
- 7b** обикновени и канеленовидни лесивирани, рядко с рендзини – 3/5
Luvisols (haplic, chromic) – 3/5
- 7c** асоциации от светли лесивирани, с планосоли, рядко с ранкери или канелени – 3/4/4a
Ass. Albic Luvisols - Planosols and Leptosols (umbric) – 3/4/4a
- 7d** асоциации от светли и обикновени лесивирани с планосоли и рядко с ареносоли – 3/4+3
Ass. Luvisols (albic, haplic) - Planosols and Arenosols – 3/4+3

Chernozems
Fluvisols, Gleysols
Phaeozems. Luvisols, Vertisols

4. Soil degradation processes

4.1. Soil erosion

Soil erosion is recognized as one of the major soil degradation processes on the territory of Bulgaria.

Water erosion – affects all agricultural land with slope over 2 degrees, or approx. 65% of agricultural land or 40% of all territory of Bulgaria.

Wind erosion – in plains and deforested areas, affects approx. 25% of agricultural land or 15% of all country territory. The most susceptible areas to wind erosion on agricultural land are the Danube plain and the Thracian lowland.

Irrigation erosion – affects all irrigated fields with slope over 2 degrees.

Soil erosion in the Danube River basin

The carbonate Chernozems most widely found soils in the Danube basin are very vulnerable to erosion because of the soft main soil-forming rocks - the loess. The extent of the erosion varies depending on the plant coverage and human impact.

Wind erosion - widely spread

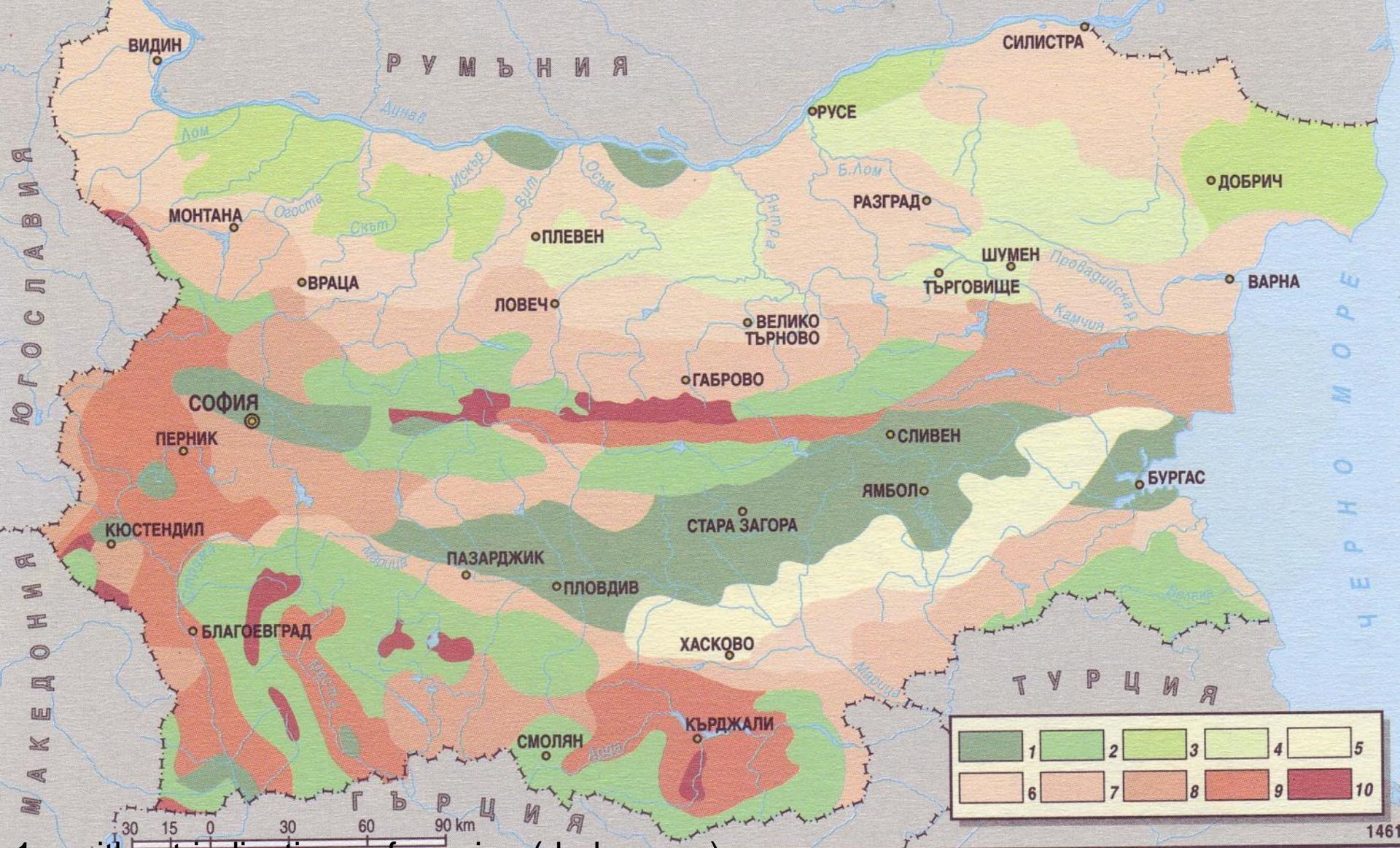
Water erosion - approximately 70 t/km² per year of the upper humus layer is lost into the Danube River.

The Bulgarian sector of the Danube River:

- Total length of the bank 470 km
- Total length of eroded bank (approx.)
 - a/ active zone – 50 km
 - b/ risk zone - 50 km
 - c/ Danube island banks risk zone - 20 km



Erosion risk areas in the Bulgarian sector of the Danube River (Rainova & Rainova, 2003)



1 – without indications of erosion (dark green)

3 – no water erosion but high wind erosion (light green)

4 – low water erosion and high wind erosion (yellow)

6 – low or medium water erosion and high wind erosion (light pink)

Map of soil erosion and deflation in Bulgaria (Geography of Bulgaria, 1997)

4.2. Soil degradation and land loss due to slope instability - landslides

About 225 landslides have been recorded along the Danube River, of them:

- About 145 landslides are currently active
- 65 potential landslides
- the rest are stabilized

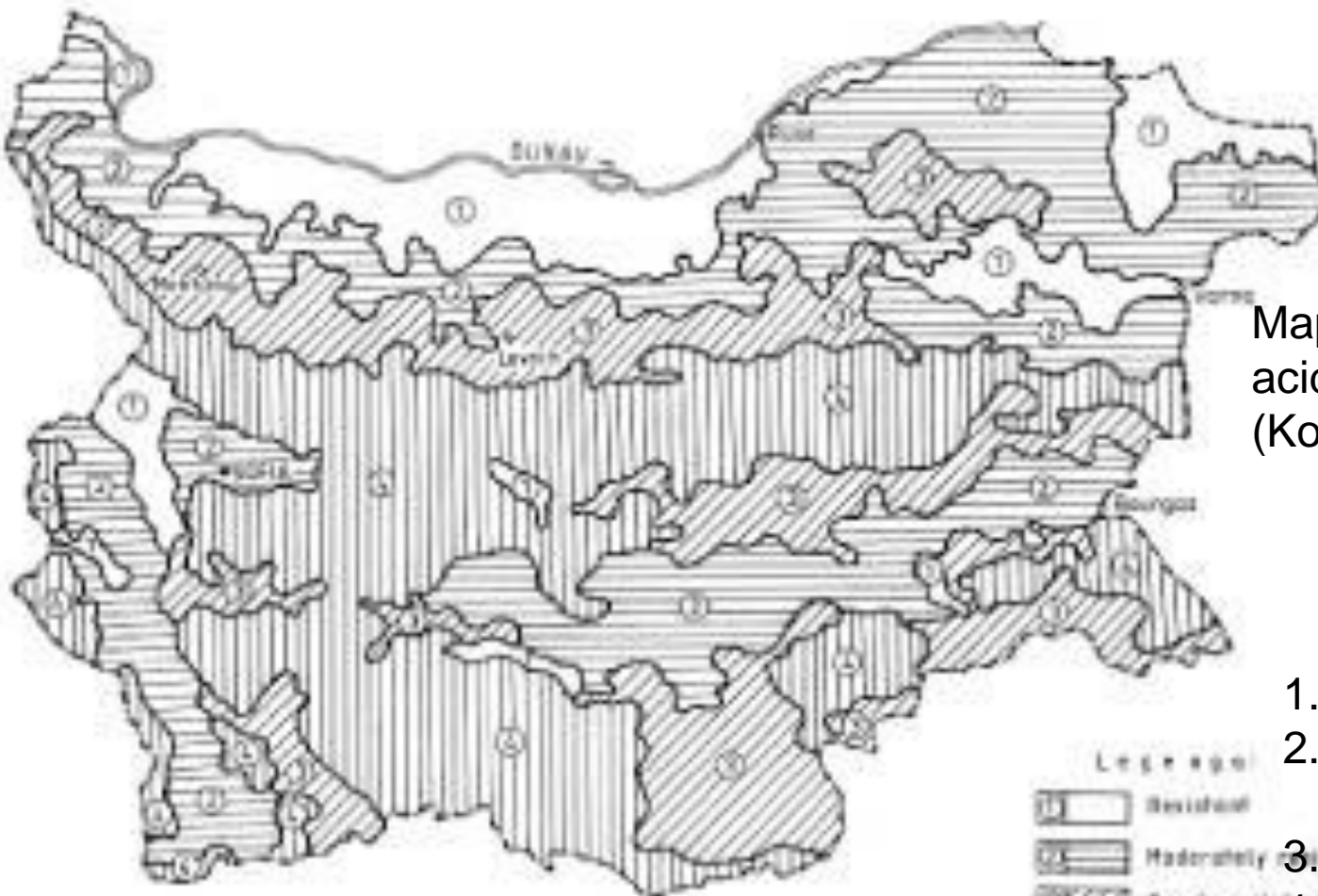
4.3. Soil contamination - Heavy metals, organic compounds, radioactive nuclides (heavy industry, agricultural chemical use – pesticides, fertilizers, waste disposal, transport)

Chemically polluted soils occupy comparatively small area of Bulgaria (only 0.2% of the total territory). The pollution has mostly local character. Most frequently found contaminants are Pb, Cu, Zn, Cd and As (lead, copper, zinc, cadmium and arsenic).

In the Danube River basin, 3 critical sites contaminated mainly by Pb, Cu and Zn, are identified – the estuary zone of Timok River (irrigation), the towns of Vidin and Ruse (agricultural chemicals, transport, irrigation).

4.4. Soil acidification - local character (4.5% of the territory of Bulgaria; 11% of agricultural land – mainly due to continuous use of nitrogen fertilizers)

4.5. Soil salinization - local character (0.3% of the territory of Bulgaria)



Map of soil vulnerability to acidification in Bulgaria (Kolchakov et al. 2009)

1. Resistant (white)
2. Moderately resistant (horizontal lines)
3. Poorly resistant (diagonal lines)
4. Non-resistant (vertical lines)



5. Soil protection policy in Bulgaria

The **Bulgarian Law of Environment Protection** (2002)

considers the soils as a limited, indispensable and non-renewable natural resource which has to be protected, used in a sustainable way and restored in order to protect human health and soil multifunctionality.

Act on Soils (State Gazette 89/2007, amend. 2009)

Makes provisions on the protection of soils and their functions, as well as on their responsible use and long-term restoration as a component of the environment.

The Act aims at:

1. Prevention of destruction of the soils and their functions;
2. Long-term protection of the soils functions;
3. Restoration of destroyed soil functions.

Act on Soils (2007, amend. 2009)

The protection, use and restoration of the soils is based on the following **principles**:

1. Ecosystem integrated approach;
2. Sustainable use of the soils;
3. Precautionary principle to prevent or limit the destruction of soils and their functions;
4. Application of good practices when using the soils;
5. The polluter pays principle;
6. Raising public awareness on the ecological and economic benefits of soil protection and measures for their protection.

National Program for erosion control and protection of Bulgarian bank of the Danube River (Ministry of Regional Development and Public Works, 1999-2003)

Program Goals:

1. To provide regular monitoring, analysis and control of erosion and related landslide processes.
2. To study erosion processes and clarify causes of erosion.
3. To identify erosion areas.
4. To provide measures for prevention and control of erosion.

Seven active erosion zones along the Bulgarian bank of the Danube River were identified. The overall length of the river bank of these zones that need protection is about 50 km.

National Regional Development Strategy of the Republic of Bulgaria for the period 2005-2015 (Ministry of Regional Development and Public Works)

Program measures:

- Protection of agricultural land and development of organic farming will be achieved by implementing of *National Strategy for the Protection of Soil Fertility*

Specific goal: Development and improvement of environmental infrastructure

- Prevention of natural risks – Danube Riverbank protection from landslides and erosion

National Agri-Environment Programme of Bulgaria (2007–2013)

Goal:

Protection of soil and water resources, including in areas affected by severe erosion or pollution (e.g. nitrate vulnerable zones) or other forms of pollution from agricultural sources.

Measures:

Measure 1: Reduction of nitrate contamination

In the implementation of the **EU Nitrates Directive** (*Council Directive 91/676/EEC concerning the protection of waters against pollution caused by nitrates from agricultural sources*). Bulgaria has designated much of its lowland area in the Danube plain and the Thracian lowland as nitrate vulnerable zones.

Measure 2: Control of soil erosion in the river catchments

National Action Program for Sustainable Management of Land and to Combat Desertification in Bulgaria (2007-2013)

In the implementation of the United Nation Convention to Combat Desertification (UNCCD)

Strategic Goal: To restrict land degradation and combat desertification in order to preserve and improve the ecosystem functions and achieve clean, safe and attractive environment, economic stability and improved living conditions.

Major objectives (6)

Objective I – Improvement of national legislation and policies in the area

Objective II – Preservation and improvement of land resources and their sustainable use

- Program 1 – Measures against erosion – 13 measures
- Program 2 – Recovery of irrigated agriculture and water protection– 9 measures

National Environmental Strategy and Action Plan (2009-2018)

In the implementation of the United Nation Convention to Combat Desertification (UNCCD) and in accordance with the EU Soil Thematic Strategy (COM(2006) 231)

Specific Goals:

1. Sustainable management of soils

- Protection of ecological functions of soils
- Protection and improvement of productivity of soils
- Sustainable use of soil resources and prevention of soil degradation

2. Soil remediation

- Limiting and/or reducing soil degradation to levels that are safe for the environment and human health

Implementation and evaluation indicators

Thank you for your attention 😊

